



## Mitigating Climate Change Effects On Agriculture In Nigeria

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**Abstract:** Climate change has become our new reality. It brings with it changes in weather patterns that can have serious repercussions for all of us, upsetting seasonal cycles, harming ecosystems and water supply, affecting agriculture and food production, causing sea-levels to rise and many other situations. Climate Change causes floods, landslides, drought and famine. As weather becomes fiercer and storms increase in frequency and intensity, serious socio-economic consequences result. Malnutrition and disease become common occurrences. Climate change has a cumulative effect on natural resources and the balance of nature. Its effects are already visible in Nigeria. This paper, therefore, is aimed at highlighting the mitigation measures to climate change effects on Agriculture. Climate change as a phenomenon is believed to be majorly caused by human activities which devastate the environment. This paper identified four kinds of activities that cause climate change. They are the burning of fossil fuels; agriculture and livestock production, changes in land use like deforestation and industrial activities. This paper also identified some effects of climate change as increased precipitation, drought, flooding, crop failures, and heat stress in livestock. This paper also advanced measures that could mitigate climate change as mulching, cover cropping, agro-forestry, etc., as water conservation strategies; crop rotation; irrigation; selection of crop and livestock that will adapt easily to climate change, use of drought resistant crops, healthy seedlings and disease resistant crops and animals, etc.

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### Introduction

Agriculture is a human activity concerned with the art and science of production and supply of food, feed and raw material for human, animal and industrial consumption. Agriculture basically involves the cultivation of crops, rearing of animals, fishing, hunting, harvesting and processing of farm produce, tapping and exploitation of forest and forest products and the marketing of agricultural products. It involves the entire value chain of agricultural activities, such as production, processing, and distribution that ensure agricultural products get to the final consumer or the end user in the form and at the time and place required. Climate change refers to any long - term change in the average weather conditions of a place (Umeghalu and Okonkwo, 2012). Average weather elements include temperature, rainfall, wind patterns humidity, cloudiness, radiation, etc. It has to do with the variability or average state of the atmosphere over periods ranging from decades to millions of years. The growing problems of climate change are more threatening to sustainable economic development and

the totality of human existence (Adejuwon, 2004). Conscious attempts at developing the rural areas and improve the livelihood of its inhabitants will have to be agriculture - oriented. It is known that climate change is affecting agriculture in many ways. A lot of studies carried out by agriculturalists, scientists and economists on the adverse effects of climate change show that agricultural production and productivity remain below thresholds in Nigeria, leading to food and fibre insufficiency and nutrition related negativities as a result of negative impact of climate change (Tasie, Wilcox and Ajie, 2017; Eze, 2016; Tasie and Ojimba, 2016; Nwuchukwu and Nnadozie, 2011 and Onyeneke, 2010).

Agricultural activities are greatly affected by climatic factors such as rainfall, temperature, humidity, radiations, wind, drought, etc. For example, climatic factors determine crop yield and productivity, animal growth, feed intake and physiology, vegetation across the agro - ecological zones of Nigeria, length of cropping and fishing seasons, etc. Climate affects the production and supply of food and raw materials thereby enhancing

or limiting the capacity of agriculture to play its crucial role as supplier of food for human and animal populations, as well raw materials for agro – based industries because agriculture in Nigeria is Climate based.

Mitigation measures and adaptation options must be put in place to reduce or cushion the negative impact of climate change. Mitigations are actions and policies that reduce exposure to climate change, for example, through regulation and institutional changes, technological shift, alterations in behaviour or changes in location. On the other hand, adaptations are actions and adjustments undertaken to maintain the capacity to deal with stresses induced as a result of current and future external changes (IPCC, 2001).

Mitigation and adaptation are processes of improving society's or farmers' ability to cope with changes in climatic conditions across time scale, from short-term (e.g seasonal to annual) to the long-term (e.g decades to centuries) Okezie and Simonyan (2011). Mitigation and adaptation occur at two main levels; the first, being the farm level that focuses on micro – analysis of farmers' decision making to cushion the effect of climate change and the national level or macro – level that is concerned about agriculture at the national level and its relationship with domestic and international policy (Bradshaw, Dolan and Smith, 2004). Micro – level analysis of mitigation and adaptation focuses on tactical decisions farmers make in response to seasonal variations in climatic, economic and other factors (Okezie and Simonyan, 2011). This paper, therefore, aims at contributing to the existing literature on micro - level mitigation measures to the effects of climate change on agriculture in Nigeria.

#### **Causes of Climate Change**

Climate change is caused by two basic factors; natural phenomenon (biogeography) and human activities (anthropogenic). Climate change had been defined as a phenomenon created by human activities and natural occurrences, which devastates the earth and gives rise to unprecedented environmental situations and is a threat to food security. In 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) attributed Earth's climate change to human activity. The single most important cause of climate change is the rapid increase in the quantity of greenhouse gases (GHG) in the atmosphere. This increase is driven mainly by four kinds of activity. These are; (a) the burning of fossil fuels, (b) agriculture and livestock production (c) Changes in land use like deforestation; and (d) industrial and urbanization activity

The elevated concentrations of greenhouse gases mean that heat is retained in the atmosphere for

longer hours and days, causing it to heat up the atmosphere. This enhanced greenhouse effect, as it is known scientifically, is caused by concentrations of several gases in earth's atmosphere, the most important of which are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrogen oxide (N<sub>2</sub>O) and fluorinated gases.

Carbon dioxide (CO<sub>2</sub>) enters the atmosphere through burning fossil fuels (coal, natural gas and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g manufacturing of cement). Methane (CH<sub>4</sub>) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. Nitrous oxide (N<sub>2</sub>O) is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

Hydro fluorocarbons, per fluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. These gases are referred to as High Global Warming Potential gases (High GWP gases). Under normal circumstances the sun's rays hit the earth and are reflected back into space. However, gases in the atmosphere such as carbon dioxide, nitrogen oxide, and methane and fluorinated compounds form a barrier for sun light. It's because of this property of these gases the reflected rays of the sun are trapped in the atmosphere, thereby heating it up.

The earth's climate is influenced through natural causes like volcanic eruptions, ocean current, the earth's orbital changes and solar variations.

#### **Effect of Climate Change on Agriculture**

Human activities as pointed out earlier are to a large extent responsible for the variations in climate. Climate change does not only affect agriculture, but surely affects lives and overall development (Ifeanyi – Obi, Etuk and Jike - Wai, 2012). Eboh (2009) stated that the effects of climate change are projected to manifest in land and water regimes especially in the areas of droughts, flooding, water shortages, desertification, disease and pest outbreaks on crops and livestock. In their own contributions, Adefalolu (2004), NEST (2004), Allison (2006), IPCC (2007), Anyadike (2009) and Ozor (2009) summarized the effects of climate change as incidence of environmental degradation which include:

- (i) Rise in sea level by between 18-59 centimeters. This is because warmer water occupies more space than cold water. This is one of the reasons for flooding in some parts of Nigeria which destroyed farm lands and

- people's homes, exposing them to health hazards, loss of lives and property.
- (ii) Increased precipitation for some areas and regions and increased dryness for another area.
  - (iii) Atmospheric temperature rise which can increase the heat load and stress of livestock thereby reducing the grazing time of cattle and feeding time of poultry and eventually leads to weight loss and reduction in market value.
  - (iv) Global warming affects aquatic ecosystems and aquaculture is threatened by warmer water bodies and changes in salinity. This situation affects negatively fish farmers and their dependents.
  - (v) As temperature rises and rainfall pattern irregular, crop yields are expected to drop significantly due to crop failure.

#### Measures to Mitigate the Effects of Climate Change on Agriculture

Kesit and Ndaeyo (2011) and Umeghalu and Okonkwo (2012) in their separate works outlined the measures to mitigate or cushion the effects of climate change. These measures are.

1. **Conservation:** Water conservation strategies like mulching, cover cropping, and relay cropping, agro-forestry, etc, should be adopted to reduce erosion and soil degradation thereby increasing soil performance which leads to increased crop yield.
2. **Crop Rotation:** A return to crop rotation would substantially reduce soil erosion and run-off and improve the control of insect, disease and weeds.
3. **Irrigation:** Irrigation is to supplement rainfall. Nigeria has a lot of rivers and streams, as well as large reservation of ground water that can be utilized for irrigation purposes. This will allow farmers raise crops in areas where there is a shortfall in annual rainfall, thereby increasing agricultural productivity.
4. **Improving Crop Varieties:** Selection of crop varieties that will adapt to soil and rainfall regimes of an area. Drought resistant crops, healthy seedlings and disease resistant crops should be cultivated.
5. **Mixed Farming:** A combination of crop and livestock production can help farmers cope with drought while boosting profit and household nutrition.
6. Farm operations should be properly timed especially in those areas where rainfall is erratic and temperature level fluctuating.
7. Breeding of livestock that can survive in extreme heat conditions e.g. goat and sheep.

8. Excessive bush clearing and felling of trees as well as bush burning should be discouraged and stopped.

#### Conclusion

Climate change is a global phenomenon with its adverse effect on food security and agricultural productivity. Climate change is mainly caused by human activities which induce the emission of greenhouse gases (GHG) into the atmosphere. These gases give rise to climatic situations like high temperature, erratic rainfall, low/high humidity, etc. The effects of this climate change are; decreasing trends in crop and animal production, rising sea levels, drought, water shortages, desertification and disease and pest outbreaks. So, measures for mitigation of the effects of climate change suggested in this paper must be adhered to strictly to cushion the effects of climate change on agriculture.

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